CLAIMS

1. A light emitting apparatus comprising:

a light emitting device disposed on a supporting body;

a fluorescent substance that absorbs at least a portion of light emitted by said light emitting device and emits light of a different wavelength; and

a coating layer that contains said fluorescent substance and covers at least the surface of said light emitting device,

wherein said coating layer comprises an oxide including at least one element selected from the group consisting of Si, Al, Ga, Ti, Ge, P, B, Zr, Y, Sn, Pb and alkali earth metals, and a hydroxide including at least one element selected from the group consisting of Si, Al, Ga, Ti, Ge, P, B, Zr, Y, Sn, Pb and alkali earth metals.

2. The light emitting apparatus according to claim 1,

wherein said oxide is the main component of said coating layer, and said hydroxide contains the same metal as that of said oxide.

3. The light emitting apparatus according to claim 1 or 2,

wherein said fluorescent substance particles in said coating layer are surrounded by particles containing said oxide as the main component.

4. The light emitting apparatus according to any one of claims 1 to 3,

wherein said coating layer comprises an organometallic compound containing at least one element selected from the group consisting of Si, Al, Ga, Ti, Ge, P, B, Zr, Y, Sn, Pb and alkali earth metals.

5. The light emitting apparatus according to any one of claims 1 to 4, wherein said coating layer has substantially uniform thickness over the top surface, the side faces and the corners of said light emitting device.

6. The light emitting apparatus according to any one of claims 1 to 5, wherein said coating layer continuously covers the surface of said supporting body and the entire surface of said light emitting device, and the thickness of said coating layer provided on the top surface, the side faces and the corners of said light emitting device and the thickness of said coating layer provided on the surface of said supporting body are substantially the same.

7. The light emitting apparatus according to any one of claims 1 to 6, wherein said coating layer comprises at least two layers, each having a refractive index that is smaller than that of nitride semiconductors that constitutes said light emitting device, and the refractive index of each layer decreases gradually with the distance from said light emitting device.

8. The light emitting apparatus according to any one of claims 1 to 7, wherein said light emitting device is disposed so as to oppose the top surface of said supporting body via an adhesive layer, while the adhesive layer contains the same material as that of said coating layer.

9. The light emitting apparatus according to any one of claims 1 to 8, wherein said adhesive layer contains particles of an oxide and a hydroxide.

10 The light emitting apparatus according to any one of claims 1 to 9,

wherein said adhesive layer continuously extends over the side faces of said light emitting device.

11. The light emitting apparatus according to any one of claims 1 to 10,

wherein said light emitting device has a main emission peak at a wavelength from 250 nm to 530 nm, and main emission wavelength of said fluorescent substance is longer than the wavelength of the main emission peak of said light emitting device.

12. The light emitting apparatus according to any one of claims 1 to 11,

wherein said fluorescent substance is yttrium aluminum garnet-based fluorescent substance that includes: Y; Al; at least one element selected from among Lu, Sc, La, Gd, Tb, Eu and Sm; and at least one element selected from among Ga and In,

and said fluorescent substance is activated with at least one element selected from among rare earth elements.

13. The light emitting apparatus according to any one of claims 1 to 12,

wherein said fluorescent substance includes: N; at least one element selected from among Be, Mg, Ca, Sr, Ba and Zn; at least one element selected from among C, Si, Ge, Sn, Ti, Zr and Hf; and a nitride-based fluorescent substance activated with at least one element selected from among rare earth elements.

14. The light emitting apparatus according to any one of claims 1 to 13,

wherein said light emitting device emits light in ultraviolet region and said coating layer contains at least one fluorescent substance selected from among:

(1) $Ca_{10}(PO_4)_6FCl$: Sb, Mn

(2) $M_5(PO_4)_3Cl$: Eu (M represents at least one element selected from among Sr, Ca, Ba, Mg)

(3) $BaMg_2Al_{16}O_{27}$: Eu

(4) $BaMg_2Al_{16}O_{27}$: Eu, Mn

(5) $3.5MgO \cdot 0.5MgF_2 \cdot GeO_2$: Mn

(6) Y_2O_2S: Eu

(7) $Mg_6As_2O_{11}$: Mn

(8) $Sr_4Al_{14}O_{25}$: Eu

(9) (Zn, Cd)S: Cu

(10) $SrAl_2O_4$: Eu

(11) $Ca_{10}(PO_4)_6ClBr$: Mn, Eu

(12) Zn_2GeO_4: Mn

(13) Gd_2O_2S: Eu, and

(14) La_2O_2S: Eu

15. The light emitting apparatus according to any one of claims 1 to 14, wherein said supporting body has lead electrodes and said light emitting device is provided on said supporting body that is insulated from said lead electrodes.

16. A light emitting apparatus comprising: a supporting body; a light emitting device constituted from gallium nitride-based compound semiconductor layers formed on a substrate, said light emitting device being disposed on said supporting substrate so that the substrate-side surface of said light emitting device opposes the top surface of said supporting body via an adhesive layer;

wherein said adhesive layer comprises an oxide containing at least one

selected from the group consisting of Si, Al, Ga, Ti, Ge, P, B, Zr, Y, Sn, Pb and alkali earth metals and a hydroxide containing at least one element selected from the group consisting of Si, Al, Ga, Ti, Ge, P, B, Zr, Y, Sn, Pb and alkali earth metals.

17. The light emitting apparatus according to claim 16,

wherein said adhesive layer includes particles of said oxide and said hydroxide.

18. The light emitting apparatus according to claim 16 or 17,

wherein said adhesive layer continuously extends over the side faces of the light emitting device.

19. The light emitting apparatus according to any one of claims 16 to 18,

wherein said light emitting device has a main emission peak at a wavelength in a range from 250 nm to 530 nm.

20. The light emitting apparatus according to any one of claims 16 to 19,

wherein the adhesive layer contains a filler having heat conductivity higher than that of said oxide.

21. The light emitting apparatus according to any one of claims 1 to 20,

wherein said light emitting device includes:

a support substrate;

a junction layer that is formed on one principal surface of the support substrate, said junction layer having a eutectic layer; and

stacked layers comprising a p-type nitride semiconductor layer of single-

layer or multi-layer structure formed on the junction layer, an active layer formed on the p-type nitride semiconductor layer, and an n-type nitride semiconductor layer of single-layer or multi-layer structure formed on the active layer.

22. The light emitting apparatus according to claim 21,

wherein at least part of the surface of the stacked layers has a concave-convex shape.

23. A method of manufacturing a light emitting apparatus comprising a light emitting device disposed on a supporting body; a fluorescent substance that absorbs at least a portion of light emitted from said light emitting device and emits light of a different wavelength; and a coating layer that includes said fluorescent substance and covers at least the surface of said light emitting device, the method comprising:

a first step of preparing a coating solution that contains an organometallic compound including at least one element selected from the group consisting of Si, Al, Ga, Ti, Ge, P, B, Zr, Y, Sn, Pb and alkali earth metals; an organic solvent; and a fluorescent substance;

a second step of applying said coating solution onto the surface of said light emitting device and the surface of said supporting body; and

a third step of drying said coating solution so as to fix said fluorescent substance.

24. The method of manufacturing a light emitting apparatus according to claim 23,

wherein boiling point of said organic solvent used in said first step is in a

range from 100°C to 200°C.

25. The method of manufacturing a light emitting apparatus according to claim 23 or 24,

wherein said coating solution used in said first step is a hydrolyzed solution having viscosity in a range from 2.5 to 500 cps at 25°C.

26. The method of manufacturing a light emitting apparatus according to any one of claims 23 to 25,

wherein said coating solution used in said first step has acid concentration in a range from 20 to 500 ppm.

27. The method of manufacturing a light emitting apparatus according to any one of claims 23 to 26,

wherein said coating solution including said fluorescent substance is sprayed in the form of mist of rotating spiral stream onto said light emitting device from above, while said light emitting device mounted on said supporting body is heated in said second step.

28. The method of manufacturing a light emitting apparatus according to any one of claims 23 to 27,

wherein said light emitting device is heated to a temperature in a range from 50°C to 300°C in said second step.

29. The method of manufacturing a light emitting apparatus according to any one of claims 23 to 28,

wherein the organometallic compound used in said first step is at least

one selected from the group consisting of methyl silicate, ethyl silicate, N-propyl silicate, N-butyl silicate, aluminum isopropoxide, aluminum ethoxide and aluminum butoxide.

30. A method of manufacturing a light emitting apparatus having a supporting substrate; a light emitting device consisting of gallium nitride-based compound semiconductor layers formed on a substrate, said light emitting device being disposed so that the substrate-side surface of said light emitting device opposes the top surface of said supporting body via an adhesive layer, the method comprising:

a first step of preparing an adhesive solution that contains an organometallic compound containing at least one element selected from the group consisting of Si, Al, Ga, Ti, Ge, P, B, Zr, Y, Sn, Pb and alkali earth metals, and an organic solvent, so as to obtain a hydrolyzed solution having viscosity in a range from 2.5 to 500 cps at 25°C and acid concentration in a range from 20 to 500 ppm;

a second step of applying the adhesive solution to the top surface of said supporting body and placing said light emitting device on the adhesive solution; and

a third step of drying the adhesive solution at a temperature in a range from 50°C to 300°C so as to bond the top surface of said supporting body and the substrate-side surface of said light emitting device.

31. The method of manufacturing a light emitting apparatus according to claim 30,

wherein boiling point of said organic solvent used in said first step is in a range from 100°C to 200°C.

32. The method of manufacturing a light emitting apparatus according to claim 30 or 31,

wherein said organometallic compound used in said first step is at least one selected from the group consisting of metal alkoxide, metal diketonate and metal carbonate.

33. The method of manufacturing a light emitting apparatus according to any one of claims 30 to 32,

wherein said adhesive layer contains a filler having heat conductivity higher than that of the oxide generated from said organometallic compound.

34. A method of manufacturing a light emitting apparatus having a light emitting device disposed on a supporting body; a fluorescent substance that absorbs at least a portion of light emitted by said light emitting device and emits light of a different wavelength; and a coating layer that includes the fluorescent substance and covers from the surface of said supporting body to the entire surface of said light emitting device,

wherein a coating solution containing said fluorescent substance is sprayed in the form of mist of rotating spiral stream onto said light emitting device from above, while said light emitting device mounted on said supporting body is heated.

35. The method of manufacturing a light emitting apparatus according to claim 34,

wherein the diameter of the spiral stream increases from the start point of the spray located above said light emitting device toward the surface of said

light emitting device.

36. The method of manufacturing a light emitting apparatus according to claim 34 or 35,

wherein rotating speed of said coating solution decreases from the start point of the spray located above said light emitting device toward the surface of said light emitting device.

37. The method of manufacturing the light emitting apparatus of any one of claims 23 to 36,

wherein said light emitting device comprises

a support substrate,

a junction layer that is formed on one principal surface of said support substrate, said junction layer having a eutectic layer; and

stacked layers including a p-type nitride semiconductor layer of single-layer or multi-layer structure formed on the junction layer, an active layer formed on the p-type nitride semiconductor layer; and an n-type nitride semiconductor layer of single-layer or multi-layer structure formed on the active layer.

38. The method of manufacturing a light emitting apparatus according to claim 37,

wherein at least a portion of the surface of said stacked layers has a concave-convex shape.